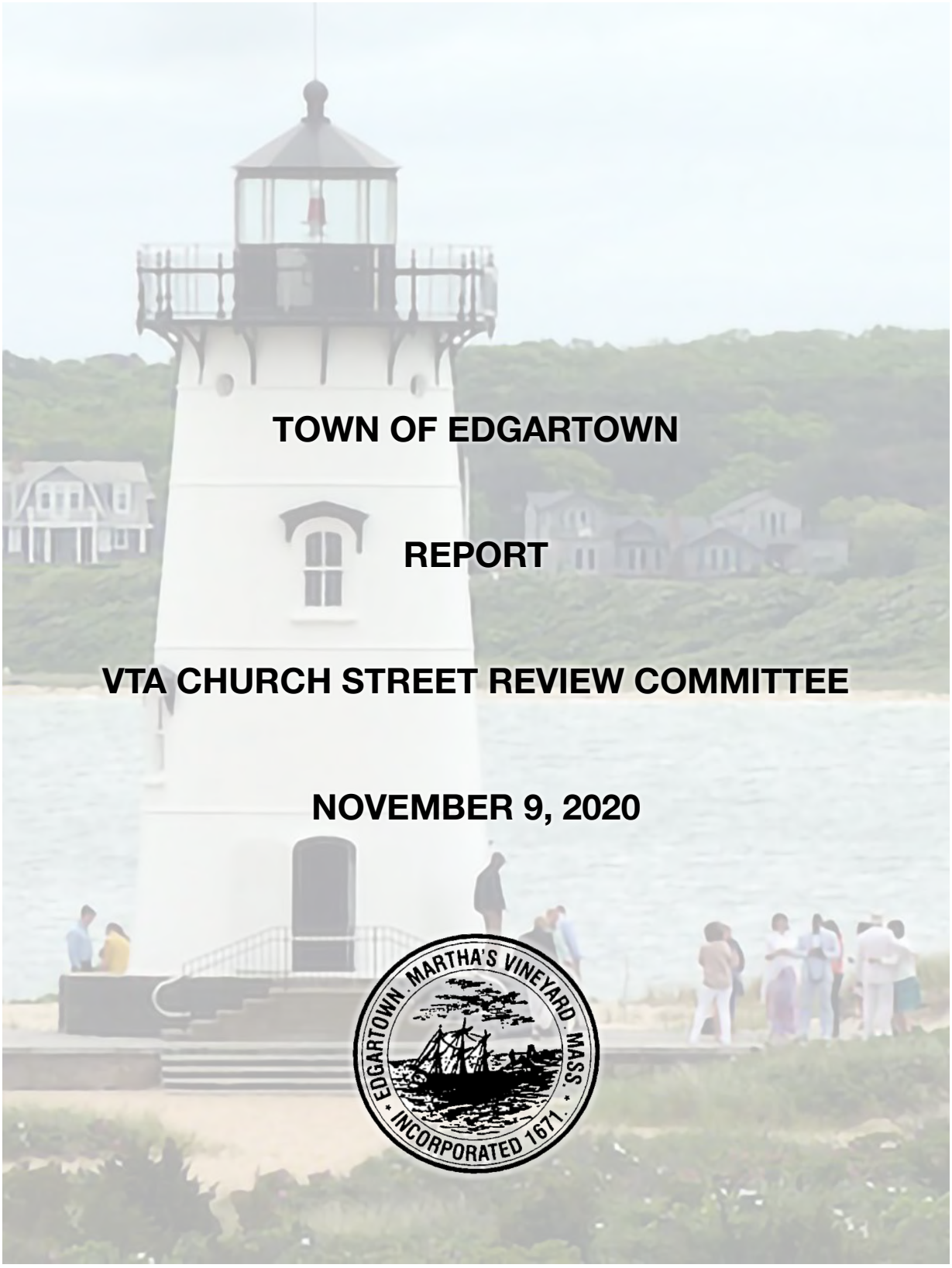


TOWN OF EDGARTOWN

REPORT

VTA CHURCH STREET REVIEW COMMITTEE

NOVEMBER 9, 2020

IMAGES OF THE VISITOR CENTER BEFORE AND AFTER THE PROJECT:



The above photo was taken in early October 2020. The trees at the left and in the center would remain as is.



Artist's rendering of the Visitor Center improvements as approved by the Historic District Commission. Note the electrical cabinets (at the right edge and the left edge of the image) and a new tree at the far right.

VTA CHURCH STREET REVIEW COMMITTEE
TOWN OF EDGARTOWN
REPORT
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This committee strongly supports the installation of three inductive bus chargers under Church Street in Edgartown. The inductive charger project has no cost to the town, will have an overall positive impact on the attractiveness of Church Street, and is essential to achieving all-electric bus service for Martha's Vineyard.

SHORT SUMMARY OF CRITICAL POINTS:

Why is the Martha's Vineyard Transit Authority (VTA) going all-electric? An all-electric fleet of buses will eliminate the air pollution and noise pollution caused by diesel buses, which will benefit everybody on Martha's Vineyard. An all-electric fleet of buses will also result in reduced maintenance and fuel costs for the VTA.

Why are inductive chargers needed? Electric buses currently do not have batteries that can power them for a full day without recharging. On-route inductive charging for 7-10 minutes at the natural end point of a bus route several times during the day allows an electric bus to run for the whole day. Inductive bus chargers are installed under the street and charge a bus wirelessly when the bus is stopped over the charger. If the VTA is to be all-electric in the foreseeable future, the buses must have on-route inductive charging.

Why are inductive chargers needed on Church Street in Edgartown? The Church Street location serves half of the VTA bus routes (directly and indirectly) and two-thirds of the VTA's daily buses on the roads. Routes 1, 3-5-6, 8, and 11 cannot be all-electric in the foreseeable future without inductive chargers on Church Street.

What are the effects on Church Street? There will be no change to the lengths of the buses on Church Street, the number of buses on Church Street, or the amount of time each bus spends there. The inductive chargers will be unobtrusive, appearing as three flat rectangular plates set flush with the pavement in the bus stop lane and with minimal markings on the street. There will be two large electrical equipment cabinets in front of the Visitor Center, screened with fencing and/or decorated with informational graphics which will be more specifically approved by the Edgartown Historic District Commission before installation.

Two (or possibly three) Norway maples that are in poor condition will be removed, and three new trees will be planted. The large linden tree and the large sycamore tree will remain.

The street will be widened by 2' for a distance of 55' immediately opposite the Visitor Center.

The project scope includes a much needed renovation of the waiting area in front of the Visitor Center, including a covered shelter, new seating, and new signage to help visitors navigate downtown, as well as the removal of most of the utility poles on Church Street and the installation of eight old-fashioned street lanterns.

SHORT LIST OF QUESTIONS AND ANSWERS:

	Question	Short Answer
1	*What was this committee asked to do?*	This committee was asked to take a fresh look at whether inductive chargers should be installed on Church Street to facilitate all-electric VTA bus service. The committee was specifically charged not to consider locations other than Church Street or changes to the VTA schedules, routes, or numbers or sizes of buses.
2	*How many trees will be removed from Church Street?*	Only one tree (a Norway maple which is in poor condition) will be removed because of the inductive chargers. The project also includes the removal of two other trees (also Norway maples which are in poor condition, one that is too close to the Visitor Center building and one that partially blocks the street) and the addition of three new trees. The large linden tree and the large sycamore tree will remain as is.
3	How much will Church Street be widened?	Less than half of the width of the grass strip across from the Visitor Center will be paved for only one-third of its length. The new paving will be 2' x 55' and is unrelated to the inductive chargers.
4	*How will the Visitor Center look different*?	There will be two new metal electrical cabinets in front of the Visitor Center. These will be decorated with informational graphics and maps, which are badly needed outside the Visitor Center, and/or possibly screened with movable fencing. Also, the two large areas of bare earth in front of the Visitor Center where passengers wait will be replaced with low-maintenance paving stones and granite topped walls for seating. Along the sidewalk, three utility poles will be taken out, and eight old-fashioned street lanterns will be put in.
5	*How much noise will the inductive charging equipment make?*	The cooling fans in the two electrical cabinets in front of the Visitor Center will make a whirring noise when a bus is actually charging. A diesel bus pulling away from the curb is about four times louder.
6	*Will the sizes of the buses change?*	The lengths of the buses are not expected to change. The lengths are determined by the variations in passenger loads, which are mostly seasonal, not whether the buses are charged inductively. The widths of the buses are determined by the manufacturers. The inductive chargers are needed no matter what sizes of buses are used.
7	*Could a location for the chargers other than Church Street work?*	No. Church Street is the primary bus stop, with a scheduled 7-10 minute stop for four bus routes, so there must be inductive chargers on Church Street if the VTA is to be all-electric in the foreseeable future. Putting the chargers at the Edgartown park and ride at Dark Woods is impractical and undesirable for reasons summarized at the end of this report.

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BACKGROUND:

Since 2017, with the approval and/or support of the Edgartown Historic District Commission, the Edgartown Board of Trade, the Edgartown Energy Committee, the Edgartown Board of Selectmen, the Boards of Selectmen of the other five Martha's Vineyard towns, the Vineyard Trust (formerly the Preservation Trust), and the Martha's Vineyard Commission, the VTA has been steadily working to implement a plan to become all-electric.

The Church Street part of the VTA plan took shape, in part, based on the discussions of a stakeholder group convened by the Edgartown Board of Selectmen at the request of the VTA. The stakeholder group consisted of a member of the Edgartown planning board, a member of the Edgartown Historic District Commission, a member of the Edgartown Beautification Committee, a representative of the 19 Church Street property – Doris Ward (who lives immediately across Church Street from the Visitor Center and is also a member of this committee), a landscape architect, the Edgartown town administrator, the superintendent of the Highway Department, the superintendents of the Water and Wastewater Departments, and the chair of the Edgartown Energy Committee.

In 2018 the VTA began acquiring electric buses to replace diesel buses as the diesel buses reached the end of their useful lives. The VTA now has 12 electric buses out of a total of 32 buses. In the summer of 2021, the VTA will have 16 electric buses. The VTA's plan is to phase out its remaining diesel buses and have an all-electric fleet of buses by 2027.

The benefits of an all-electric fleet are numerous, including reduced air and noise pollution that will result in quality of life improvement for everyone in Edgartown and elsewhere on Martha's Vineyard. The conversion is also expected to have economic benefits resulting from reduced maintenance and fuel costs for the VTA.

The VTA fleet of buses will not be all-electric by 2027 without on-route inductive chargers. On-route inductive charging allows electric buses to safely augment their batteries while stopped to drop off and pick up passengers. The small on-route supplement of power repeated throughout the day is enough to extend the service time of the bus for the whole day. Without inductive charging, the VTA will have to switch out buses mid-day for other buses, either diesel or electric, which would significantly increase the number of buses needed to provide the current levels of service. Switching out buses would also require additional drivers and labor hours. On-route inductive charging allows the VTA to extend the range of electric buses in a cost effective and efficient manner.

The reason why Church Street was selected as a site for the installation of on-route inductive chargers is because it serves four bus routes, each of which has a scheduled stop of 7-10 minutes at this location. No alternative location for the chargers would be as effective in providing on-route charging for the VTA bus system because there is no other location with scheduled 7-10 minute stops for these four bus routes.

In 2020 a citizen petition resulted in the inclusion of Article 10 in the Warrant for the Special Town Meeting of June 13, 2020. This article asked, "Shall the installation of an electric-inducing bus-charging Terminal on Church Street, by the regional Vineyard Transit Authority (VTA), in the heart of the Edgartown Historic District, be reconsidered?" The vote was 96 - 83 in favor of the reconsideration, and the Board of Selectmen formed this committee to undertake the reconsideration. The Board of Selectmen specifically charged this committee not to consider locations other than Church Street or changes to the VTA schedules, routes, or numbers or sizes of buses.

The committee met by Zoom on July 30, August 20, August 25, September 8, September 29, October 5, October 13, October 20, and October 23, 2020. The committee also had a site visit to Church Street on September 9. The committee listened to multiple presentations, questions, and answers in reviewing the history and details of the proposed project.
The committee consisted of the following participants:

Keith Chatinover, Dukes County Commissioner and Edgartown Historic District resident
Jane Chittick, Edgartown Historic District resident (resigned on September 7, 2020)
Angie Gompert, VTA Administrator (non-voting participant)
Julia Livingston, Edgartown village resident (Committee Vice Chair and Clerk)
Sara Piazza, Edgartown Historic District resident (resigned on September 7, 2020)
Mark Snider, Appointed Edgartown Representative to the VTA Board and Edgartown resident
Alan Strahler, Edgartown Energy Committee Chair and Edgartown resident (Committee Chair)
Bill Veno, MVC Planner and Edgartown resident
Doris Ward, Church Street resident immediately across from the Visitor Center

DISCUSSION:

A. THE NEED FOR THE INDUCTIVE CHARGERS

The distance a fully charged electric bus can travel is not sufficient for the long hours and miles of VTA routes. The VTA currently has 20 diesel buses and 12 electric buses. Four of the electric buses are 30' x 96" with an effective range of approximately 130 miles, and the eight remaining electric buses are 35' x 102" with an effective range of approximately 160 miles. In order to run for a full day, a bus in the VTA system needs to go 300 - 350 miles. The difference between the 300 - 350 mile needed range and the 130 - 160 mile current effective range of the electric buses is the basic problem the VTA needs to solve in order to go all-electric. Several possible solutions have been considered, as described in the following paragraphs:

1. Possible solutions that would not require on-route charging. This committee discussed three possible solutions that would not require the installation of on-route chargers or any other construction on Church Street as follows:

a. Taking the electric buses out of service for several hours when their batteries get low during the day and charging them at the airport VTA headquarters. In an all-electric system, freshly charged electric buses could be swapped in for the buses with spent batteries (while the buses with spent batteries recharge at the airport VTA headquarters), but this would require the VTA to add 32 additional electric buses for a total of 64 buses, as opposed to the 32 the VTA currently has. This possible solution to the problem is not being pursued because the capital and operating costs of the extra buses would be unacceptable.

b. Using "hybrid" buses instead of electric buses until all-electric buses have better batteries with longer ranges. A hybrid bus has a full diesel system in addition to an electric system. Our committee heard that diesel only works well in places where the buses run at speeds over 45 mph for extended periods, generating enough heat to clean the particulate filters, which does not happen on Martha's Vineyard. Diesel maintenance is costly for either pure or hybrid diesel, and the substantial maintenance cost savings from the conversion to an all-electric system would not be realized with hybrid buses. Also, the noise and fumes associated with diesel operation would remain. For these reasons hybrid buses are not being pursued by the VTA.

c. Waiting for better batteries. In order to wait until bus batteries and/or other technologies have improved to the point that all sizes of buses needed by the VTA would have a range of 300 - 350 miles without recharging during the day, the VTA would need to continue operating with diesel buses. This possible solution to the problem is not being pursued at this time because there is no way to know how long this will take, if it is ever achieved.

2. Two different kinds of on-route charging. On-route charging allows electric buses, while they are stopped to drop off and pick up passengers, to safely augment their batteries with small supplements of power repeated throughout the day. This committee discussed two kinds of on-route charging as follows:

a. Conductive chargers. This possible solution is not being pursued because conductive chargers require 500 kW of electricity, as opposed to the 150 kW of the proposed inductive chargers, and because conductive chargers are installed on cranes and charge the buses from overhead. Conductive chargers are very visible and industrial looking. This kind of charger would not be compatible with the look of the Edgartown Historic District or any other location along the Martha's Vineyard bus routes.

b. Inductive chargers. Inductive chargers involve an electric coil under the street and an electric coil on the underside of each bus. When the coil attached to the underside of the bus is directly above the coil under the street, the driver pushes a button on the dashboard, and the charge flows into the bus battery wirelessly. The VTA conducted a Request for Proposals (RFP) process for inductive chargers. Two companies submitted proposals, and a company called Momentum Dynamics received the higher scores from all reviewers and was selected to provide inductive chargers for Martha's Vineyard.

EXPERIENCE IN WENATCHEE, WASHINGTON, WITH MOMENTUM DYNAMICS INDUCTIVE CHARGERS:

Ed Archer, the maintenance director for the Link transportation system in Wenatchee, Washington, was invited to join our committee's meeting on August 20, 2020. He told our committee that, without on-route inductive charging, an electric bus can run about 8 hours, but with on-route inductive charging it can run for a full, uninterrupted 14-16 hour day. The Link system's electric buses charge for 5 minutes every hour or half hour during their natural "dwell time" when they are letting off and taking on passengers. Ed sends out a bus in the morning with a 100% charge, and at the end of the day the charge is at 64%. The bus gains about 1% toward a full charge for every minute it is in place above an inductive charger. Ed said the Link system's experience with the "generation 1" Momentum Dynamics inductive charger installed in February 2018 was very successful, so the Link system is now installing three "generation 2" Momentum Dynamics inductive chargers. He said the generation 1 charger transformed how they were able to function because they could keep an electric bus in service for 24 hours a day, seven days a week. He said that, if you don't have on-route charging, you will need one or two additional buses for each route, which is expensive. He said the chargers are unobtrusive, with only a 4' x 7' electrical cabinet nearby and no footprint in the street. He said there is very little maintenance. The coolant needs to be checked every 6 months, and Momentum Dynamics monitors the system remotely. A few times a year a circuit breaker needs to be reset. Once his system needed a new fan, and it arrived and was installed within 24 hours. Ed said Momentum Dynamics was very reliable and very responsive. He said it was some of the best service he's ever seen in transit.

B. CHANGES ON CHURCH STREET DIRECTLY RELATED TO THE INDUCTIVE CHARGERS

The three in-ground charger coils installed under the street in the bus stop lane on Church Street will be served by two electrical cabinets located near the front corners of the Visitor Center property. Additional electrical cabinets for an Eversource transformer and switching equipment and a battery that will feed the inductive chargers will be placed at the back of the parking area on the north side of the Visitor Center.

1. Inductive charger electrical cabinets. The three inductive chargers proposed by the VTA for Church Street require two electrical cabinets (one is 89"l x 36"w x 72"h and the other is 66"l x 36"w x 71"h). The larger (300 kW) cabinet is located near the the northwest corner of the property at the edge of the parking lot and will serve two of the inductive chargers. The smaller (150 kW) cabinet is located near the southwest corner of the property and will serve the third inductive charger. At the Historic District Commission meeting on October 3, 2019, it was noted that these metal cabinets are the most unsightly part of the project, but that they could be wrapped with graphics printed on vinyl that could be

attractive and of interest to bus riders. The cabinets could also be screened with fencing. There will be cooling fans in these cabinets, and they will make a whirring noise when buses are actually in place and being charged. The sound level is reported to be 70 dBA, a sonic level that various sources compare to air conditioners, modern vacuum cleaners, and office conversation. A diesel bus pulling away from the curb makes a sound that is four times louder. Members of this committee said these cabinets could be regarded as positive - an opportunity to provide useful information to visitors who now have to ask someone, for example, which way to walk to get to Main Street. The Historic District Commission's Certificate of Appropriateness for the Church Street inductive charger project is explicitly conditioned on approval of the cabinet graphic "wrap" by the Historic District Commission before it is installed. This committee agrees that these two cabinets will have a visual impact on Church Street, but on balance they are acceptable given the health, environmental, noise, cost, and other advantages of an all-electric bus system.

2. The inductive chargers. The three charger coils will be installed under Church Street in the bus stop lane. The only visible element will be three rectangular metal plates, each measuring 62" x 33" set flush into the roadway pavement in the bus stop lane with minimal markings on the street. The visual impact of these plates will be similar to that of manhole covers. Snow plowing and street sweeping will be unaffected, and there will be no impediment to bicycle or pedestrian traffic.

3. Removal of utility poles. The installation of the inductive chargers will require the water line under Church Street to be moved 12 feet to the west. The existing water pipe is 100 years old, so the project includes replacing it with a new pipe, which would appear to be a useful upgrade. The inductive charger project also requires increased electric power on Church Street, and, because the street will be opened for the relocation of the water line, the project includes putting the electric, phone, and cable lines underground and removing three utility poles on Church Street, leaving only the utility pole nearest to Main Street. Instead of the streetlights now on the three utility poles, eight old-fashioned street lanterns matching the style of those on Main Street and elsewhere in the Edgartown Historic District will be added. Removing the utility poles and installing the old-fashioned street lanterns will make Church Street look more consistent with other streets in the Edgartown Historic District. The old-fashioned street lanterns will light the whole length of Church Street, which currently is not the case with the existing streetlights, and six of the old-fashioned street lanterns will be placed outside of the sidewalk. This will improve the ADA accessibility along Church Street and in front of the Visitor Center, making the walk from the Visitor Center to Main Street or Pease's Point Way safer for all.

4. Other electrical equipment. A battery will be installed in a cabinet at the back of the parking lot next to the Visitor Center. This will allow the VTA to store and supply electricity for the chargers, which can be bought at off-peak hours when the electricity is less

expensive. Also, to replace the equipment now on the three utility poles being removed as described above, Eversource will install a transformer and switching equipment in cabinets at the back of the parking lot next to the Visitor Center. None of the equipment at the back of the parking lot will be visible from the street. It will be screened with movable plantings. No parking spaces for town employees will be lost. One VTA parking space will be lost.

5. Removal and replacement of a Norway maple on the Visitor Center property. A Norway maple near the southwest corner of the Visitor Center property needs to be removed to make room for one of the new electrical cabinets. An arborist from Beetlebung Tree Care LLC found that this tree is in poor condition because the tree canopy is thinned and has some die-back; the roots are restricted, compacted, and girdling; there is moderate decay in a 2' long trunk defect; and branches are resting on electrical, phone, and cable lines. A photograph of this tree appears in Appendix I of this report. A new tree to be chosen by the Edgartown tree warden will be planted slightly farther back on the Visitor Center property.

6. Elimination of diesel fumes and noise. Diesel fumes are unpleasant and unhealthy. In addition to the effects on the people who smell and breathe the diesel fumes, the black soot settles on surfaces and requires cleaning and painting. This committee heard that the east side of the Whaling Church (the side along Church Street) is painted every other year because of the diesel residue that accumulates on the siding. If the buses on Church Street are all-electric, there will be no diesel fumes to smell or breathe, and this painting will no longer be required. In addition, the diesel engine noise from the VTA buses will be eliminated, which will be a benefit to people who live and work along Church Street, Pease's Point Way, and upper Main Street, as well as visitors to commercial properties in the area. Audiences at the Whaling Church will also benefit, especially when the windows are open in summer. All-electric VTA buses on Church Street will make the Edgartown environment cleaner, quieter, and healthier for the future.

C. CHANGES ON CHURCH STREET NOT DIRECTLY RELATED TO THE INDUCTIVE CHARGERS

The proposed project includes other changes on Church Street that are not necessitated by the inductive chargers, but are included in the project to improve the function and appearance of the bus stop area and the Visitor Center.

1. Widening of the paved area of Church Street by 2' along a 55' strip. Widening the pavement by approximately 2' along a 55' strip on the west side of the street opposite the Visitor Center will make it easier and safer for parked buses to pull out and around each other. The widening begins at the 26 Church Street driveway and ends at a point opposite the Visitor Center parking lot. The strip of grass along the west side of the pavement is about 5' wide and 180' long. The widening is less than half of that width and less than a third of

that length. A strip of grass about 3' x 55' will thus remain opposite the Visitor Center, and the remaining strip of grass of about 5' x 120' will be untouched.

2. Removal of a Norway maple across the street from the Visitor Center. This tree removal will make it easier and safer for parked buses to pull out and pass each other on Church Street. The arborist from Beetlebung Tree Care LLC found that this tree is in poor condition because it has multiple structural defects, multiple trunk and branch wounds, an extensive trunk wound from a large branch that recently broke off on the side away from Church Street, and the roots are girdling and heaving and breaking up the asphalt curb and surrounding ground. The large branches and sections of the trunk that have grown over the street show damage from multiple collisions of trucks and other tall vehicles, including buses. A photograph of this tree appears in Appendix I of this report. Two new trees to be chosen by the Vineyard Trust (formerly the Preservation Trust) will be planted slightly farther back from Church Street on the Vineyard Trust property. The Vineyard Trust supports the inductive charger project and has given permission for the planting of these two new trees.

3. Optional removal of a Norway maple at the northwest corner of the Visitor Center building. The removal of this tree was suggested by the arborist who evaluated the other two Norway maples. He said this tree is not in good health and is too close to the Visitor Center building. A photograph of this tree appears in Appendix I of this report.

4. Linden tree and London plane tree (sycamore) to remain at Visitor Center. It should be noted that the two large shade trees at the Church Street Visitor Center that are not Norway maples (a linden and a London plane tree, otherwise known as a sycamore) will remain as is.

5. Renovation of Visitor Center waiting area. The project includes funding for a complete overhaul of the Church Street Visitor Center waiting area, including a covered shelter, new seating, new informational signs, new landscaping, and improved stormwater management. There will be 30% more seating than is now provided, and the entire area will have bricks and other paving stones. In addition, as described above, three utility poles will be removed from the Church Street sidewalk and eight old-fashioned street lanterns will be installed. At the Historic District Commission meeting on December 5, 2019, it was noted that the designers struck a pretty good balance with the overall design, taking into account that the Visitor Center building is not historic, dating from the 1980's, the site gets extensive public use, and there is an obvious need for updating. This committee agrees and feels that the visual and physical changes are significant benefits to the Edgartown downtown area.

D. WHY CHURCH STREET?

The inductive chargers must be located where the buses have scheduled and predictable dwell times of 7-10 minutes and where multiple bus routes can be served. The two bus stops serving the most bus routes are the Vineyard Haven Steamship Authority terminal and the Church Street Visitor Center. The high water table at the Vineyard Haven location makes it unsuitable for installation of underground inductive chargers, so there is simply no place on Martha's Vineyard where inductive chargers can serve as many bus routes as Church Street. A map and listing of VTA bus routes appears in Appendix II to this report.

1. Inductive chargers on Church Street will enable routes 1, 8, 11, and 13 to be fully electric. Church Street is now - and has been for many years - an end point for four bus routes (routes 1, 8, 13, and 3-5-6, which is discussed below). In addition, route 11 will be able to charge at Church Street because the route 8 buses (which will charge at Church Street throughout the day) can swap with the route 11 buses when their state of charge gets low. Inductive chargers at Church Street will enable all of these bus routes to be all-electric. Note that passengers are likely to feel frustrated and inconvenienced by an extended dwell time for charging at a stop which is a "through stop" with fewer passengers getting off and on, while a longer dwell time will not inconvenience passengers at a stop which is an "end stop" with more passengers getting off and on. In other words, at Church Street the buses will be charging in between runs, so there will be no delay experienced by passengers. If there are not going to be inductive chargers on Church Street, then bus routes 1, 8, and 11 (and possibly 13, depending on whether there is an inductive charger at Oak Bluffs) will have diesel buses for part of each day after the electric buses have depleted their batteries.

2. Inductive chargers on Church Street will enable route 3-5-6 to be fully electric. After starting at Church Street, the 6 bus proceeds via the airport to West Tisbury where it becomes the 5 bus to Aquinnah and back to West Tisbury. It then heads to Vineyard Haven as the 3 bus, returns to West Tisbury, and then becomes the 6 to the airport and Edgartown. The buses on this long route will likely charge at two inductive chargers to be installed in West Tisbury, but they will also need to charge in Edgartown because the dwell time in West Tisbury is only a few minutes and is somewhat unpredictable in duration because of Vineyard Haven traffic, while the dwell time in Edgartown is 7-10 minutes and is more predictable. As noted above, passengers are likely to feel frustrated and inconvenienced by an extended dwell time for charging at a stop which is more of a through stop with fewer passengers getting off and on, while a longer dwell time will not inconvenience passengers at a stop which is more of an end stop with more passengers getting off and on. For the 3-5-6 route, Church Street is more of an end stop in this sense than West Tisbury. If there are not going to be inductive chargers on Church Street, then the 3-5-6 bus route, in addition to bus routes 1, 8, and 11 (and possibly 13, depending on whether there is an inductive charger at Oak Bluffs) will have diesel buses for part of each day after the electric buses have depleted their batteries.

E. MOMENTUM DYNAMICS EQUIPMENT

1. Inductive chargers are safe. Momentum Dynamics charging systems include all the elements needed for safe operation:[1] detection of objects under the bus in the charging zone, sensing of misalignment of the bus and charger coil, measured exposure to magnetic and electric fields, and an on-board vehicle system to sense and control the charging. The magnetic field that escapes from under the bus during charging is minimal and is within the relevant established international standards.[2] The chargers have received UL (Underwriters Laboratories) certification. Also, inductive vehicle charging uses a very different frequency from inductive chargers for mobile phones, medical devices, and other consumer products.[3] This means these small appliances can be safely operated on or around the buses and inductive charging equipment.

2. Momentum Dynamics chargers are reliable. Momentum Dynamics monitors every charger remotely. Their system alerts users of any problems by text and email and dispatches a repair technician when needed. A member of our committee contacted maintenance supervisors at three bus systems using Momentum Dynamics chargers. In Howard County, MD, a charger serving 3 electric buses functioned without issue for 3+ years, then needed one repair. In Chattanooga, TN, a charger was used for 3+ years with 4 electric buses, and the report was that it "worked great" with "excellent tech support." In Wenatchee, WA, Ed Archer (see section A.2.b above) reported a charger in operation since February 2018 serving 3 electric buses with no significant issues. Ed remarked that the Momentum Dynamics service was very good, the best he had seen in his experience in transit.

3. The useful life of the inductive chargers for purposes of financial accounting has been set at 12 years by experienced accountants. The technology is relatively new, so this 12 year useful life may or may not prove to be correct, but inductive chargers do not have many moving parts (only fans and switches and only in the above-ground cabinets where they are relatively easy to replace), so their useful life could be longer. A committee member reported that mini-buses with inductive charging from a different manufacturer, not Momentum Dynamics, were used in Genoa and Turin, Italy, for 15 years.

[1] Bablo, J., K. Boyce, and H. Jiang, 2014, *The unique safety concerns of wireless charging*, IEEE Transportation Electrification eNewsletter, September/October 2014, 3 pp.

[2] Mohamed, A. A. S., A. Meintz, P. Schrafel, A. Calabro, 2018, *In-vehicle assessment of human exposure to EMFs from 25-kW WPT system based on near-field analysis*, National Renewable Energy Laboratory, NREL/CP-5400-71710, 8 pp.

[3] Zhang, Z., H. Pang, A. Georgiadis, and C. Cecati, 2019, *Wireless power – An overview,* IEEE Transactions on Industrial Electronics, vol. 66, no. 2, pp. 1044-1068.

F. COSTS

1. All of the costs of the proposed Church Street project will be funded by federal and state grants. The sole financial aspect of the Church Street project for the Martha's Vineyard towns will be the benefit of the reduced operating costs, both in maintenance costs and fuel costs, realized over time as the bus fleet transitions to a fully electric fleet.

2. Possible Impacts of a delay in the project. The construction of the project has been planned for the winter of 2020-2021. Delaying the project will result in increased costs to the VTA which are difficult to estimate.

a. If the project were delayed one year, until the winter of 2021-2022, the VTA operating costs would be increased. At a minimum the VTA would need to delay the retirement of the four diesel buses it planned to retire in 2021 so that they could be used, with the other VTA diesel buses, to cover the times when the electric buses with spent batteries are charging at the airport. This would mean that the bus fleet in 2021 would have 16 electric buses and 20 diesel buses for a total of 36 buses, instead of the currently budgeted 32. This increase in the number of buses would require additional maintenance and labor costs.

b. If the project were delayed one year, the capital costs of the project would probably not be materially increased, but the VTA will need to ask the Federal Transit Administration (FTA) to move various costs from earlier grants to later grants and vice versa in order not to lose the funding for the project. Currently, it is not known whether these adjustments will be permitted by the FTA.

c. A delay of longer than a year (or a failure of the Church Street inductive chargers to ever be installed) would require the VTA to buy new diesel buses and stop buying new electric buses starting in 2022. It would also likely require the VTA to have a fleet larger than 36 buses in future years, in order to have enough diesel buses to substitute in for electric buses with spent batteries when VTA ridership levels recover from their COVID-19 levels. As noted above, increased numbers of buses will mean increased labor costs. Also, increased diesel buses will mean increased maintenance and fuel costs and the continued noise and air pollution caused by the diesel buses.

G. MATTERS OUTSIDE THE CHARGE GIVEN TO THIS COMMITTEE

As noted at the outset of this report, this committee was specifically charged not to consider locations for inductive chargers other than Church Street or changes to the VTA schedules, routes, or numbers or sizes of buses. In practice, however, it proved impossible to avoid discussion of these issues, and it may be helpful to summarize those discussions in this report.

1. The sizes of the buses. Substantial concern was expressed in our committee meetings that the installation of inductive chargers would force the continued and increased use of longer and/or wider buses. In fact, this is not the case. Passenger loads and efficiencies determine the bus lengths, while the manufacturers determine the bus widths. The inductive chargers are needed no matter what sizes of buses are used. Smaller electric buses have smaller batteries, so smaller electric buses need on-route charging more frequently during the day than larger buses. Right now all of the VTA's 30' buses (diesel and electric) are 96" wide. Some of the VTA's 35' and 40' buses (diesel and electric) are 96" wide and some are 102" wide. In general, the transit bus manufacturing industry is only making buses that are 102" wide, and it should be noted that 102" wide buses are more comfortable for passengers, especially passengers using electric mobility devices and especially in times that require social distancing. As of now, the only transit bus manufacturer that makes a 96" wide bus is the manufacturer (BYD) whose buses are compatible with the Momentum Dynamics inductive chargers. BYD is the bus manufacturer from which the VTA has been acquiring and is continuing to acquire its electric buses. These 96" wide buses are 30' long, and they are electric, not diesel. If the VTA were to buy new 30' diesel buses now, only 102" wide buses would be available, while new 30' electric buses are still available from BYD at 96" wide. Ed Archer of the Link system in Wenatchee, Washington, believes there are smaller electric buses in China, and a committee member reported that mini-buses with inductive charging were used in Genoa and Turin, Italy, for 15 years. Ed Archer said he has heard through the grapevine that smaller, truck-based buses (called "cutaways") compatible with Momentum Dynamics inductive chargers are likely to be available in the United States soon. The VTA needs to have a mix of different sizes of buses for efficiency in responding to the variations, mostly seasonal, in passenger loads. This committee was told that the VTA has no plans to change any routes or schedules or to increase the sizes or numbers of buses stopping on Church Street.

2. Inductive charging at Oak Bluffs. It was suggested in our committee meetings that inductive chargers should be installed at Oak Bluffs, instead of on Church Street in Edgartown. One difficulty with this suggestion is that Oak Bluffs is a through stop, not an end stop for the route 13 buses, which means less time for charging is available. Riders would be frustrated and inconvenienced if a 7-10 minute wait for charging at Oak Bluffs had to be built into this route. Also, an inductive charger at Oak Bluffs would not solve the on-route charging

need for routes 1, 3-5-6, 8, and 11. An Oak Bluffs charger would be inefficient because, although it could serve routes 7, 9, and 13, inductive chargers on Church Street would serve more routes.

3. Combining routes 1 and 13. It was suggested in our committee meetings that routes 1 and 13 might be combined to run in a loop with inductive chargers in Oak Bluffs instead of at Church Street. This suggestion would not solve the problem for the 3-5-6, 8, and 11 buses. Also, in the summer there are more buses on route 13 than route 1, and the reverse is true in the winter. This means that running these two routes as a loop would require more buses in the fleet and more wasteful extra trips on the quieter legs of the combined route.

4. Inductive charging at the Edgartown park and ride. Our committee heard the suggestion that an Edgartown end stop should be established at a location outside the Historic District, possibly at the park and ride lot on Dark Woods Road, and inductive chargers should be installed at this new end stop, instead of on Church Street. This suggestion appears to be impractical and undesirable for the following reasons:

a. The Dark Woods park and ride lot is not where the bus passengers want to go. They want to go to the downtown area. The distance from the Dark Woods lot to the Church Street Visitor Center is 9/10 of a mile. Using the Dark Woods lot as the Edgartown end stop would not be good for the downtown business community because employees and visitors alike would be significantly inconvenienced by the need to transfer at the Dark Woods lot from large buses to smaller buses or walk the extra 9/10 of a mile. This would delay the passengers and make traveling into Edgartown by bus significantly more frustrating and inconvenient.

b. This change would require very substantial changes to the VTA's routes, schedules, and numbers and types of buses, including but not limited to (i) an increased number of cutaways or other small buses to shuttle passengers from the new end stop into the downtown area and (ii) rerouting the Up-Island (3-5-6) bus and the Katama (8) bus, which currently do not go past the Dark Woods lot.

c. If 11 large buses per hour now arrive at Church Street, transferring the passengers at the Dark Woods lot to equivalent passenger capacity on smaller shuttle buses would require some significant number of additional smaller buses, along with additional drivers for these additional buses. These additional buses would add to the traffic congestion in the downtown area. Also, the additional buses and drivers would increase the VTA operating costs.

d. The traffic at the Triangle would be much worse because larger and more numerous buses (all the 1, 3-5-6, 8, 11, and 13 buses, including the increased numbers of shuttle buses going downtown) would need to turn across traffic to get in and out of Dark Woods Road.

e. The bus shelter at the Dark Woods lot would need to be substantially enlarged and improved. It would need to have restrooms for use by the passengers and bus drivers who now use the restrooms at the Church Street Visitor Center.

f. The current routes and schedules enable the VTA to operate the entire system with only 32 buses. It was reported to this committee that a Massachusetts Department of Transportation consultant looked at the VTA routes and schedules in 2015 and again in 2020 and found them to be very efficient. This may mean that there would not be federal and state grants available for the capital costs (acquiring additional shuttle buses and building a new passenger shelter with restrooms) of this very different, less efficient, and more expensive project.

CONCLUSION:

For the reasons expressed above, this committee strongly and unanimously supports the project to install three inductive bus chargers at Church Street in Edgartown, as proposed by the VTA and previously approved and/or supported by the Edgartown Historic District Commission, the Edgartown Board of Trade, the Edgartown Energy Committee, and the Edgartown Board of Selectmen.

Respectfully submitted:

Keith Chatinover
Julia Livingston
Mark Snider
Alan Strahler
Bill Veno
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APPENDIX I: TREES TO BE REMOVED



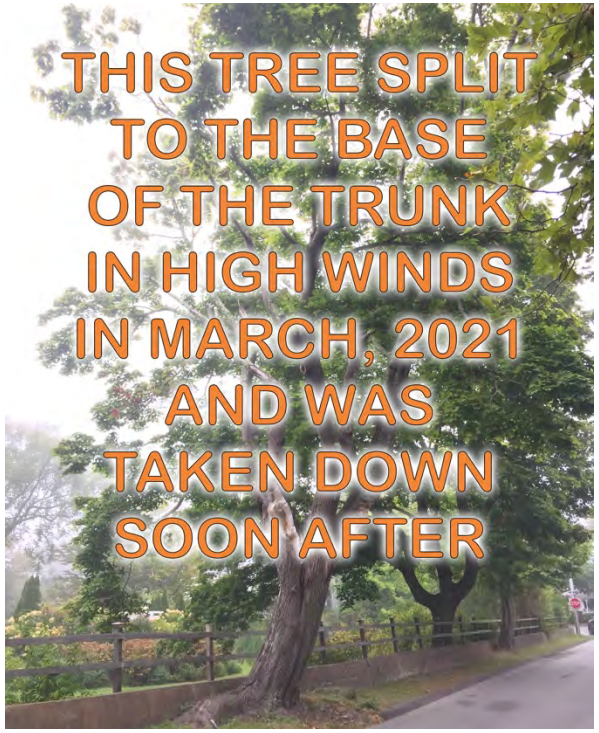
Tree to be removed to make room for new charger equipment on southwest corner of site.

ARBORIST'S REPORT:
Condition: Poor. Tree canopy is thin and has some dieback. Roots are restricted, compacted and are girdling. Moderate decay in 2' long trunk defect. Branches resting on electrical, phone & cable line. *Acer platanoides* are known to be a culturally defective street trees prone to canopy and root defects and decay.



Tree in poor condition at border of parking lot and passenger plaza, rest-room side of building. Arborist recommends removal, but tree could be retained for now.

ARBORIST'S REPORT:
Condition: Poor. Tree has major dieback in canopy and multiple defects with moderate decay. Structure is weak. Tree has (3) trunks (16", 12" & 10") with weak junctions and included bark in the tight angle crotches which are more susceptible to breakage and failure. Roots are constricted by sidewalk and paved parking area and are girdling. Roots are heaving and breaking sidewalk and parking area. *Acer platanoides* are known to be a culturally defective street trees prone to canopy and root defects and decay.



Tree across Church Street that is frequently struck by trucks and buses.

ARBORIST'S REPORT:
Condition: Poor. Old tree with multiple structural defects. Has multiple trunk and branch wounds with significant decay including a large branch over Church St. that has been hit by vehicles multiple times and an extensive trunk wound from a large branch that recently broke off from West side of the lower canopy. Roots are girdling and heaving & breaking up asphalt curb and surrounding ground. *Acer platanoides* are known to be a culturally defective street trees prone to canopy and root defects and decay.

APPENDIX II: VTA BUS ROUTE MAP

